

## **SUPPLY UNIT FOR ACCOMMODATING MEDICAL INSTRUMENTS**

### **FIELD OF THE INVENTION**

[0001] The present invention pertains to a supply unit for accommodating medical instruments with a height-adjustable middle part with side cheeks, which are designed for engaging a middle part of a medical instrument with lateral guide surfaces, which are  
5 complementary to the side cheeks.

### **BACKGROUND OF THE INVENTION**

[0002] It has been known that medical instruments, which are located, e.g., on instrument carriers of traveling and height-adjustable cart systems, can be connected to ceiling-mounted supply units. A mechanical coupling of the instrument to the ceiling-mounted supply unit is  
10 brought about via an interface, and the instrument is supplied with electricity and the necessary

gases via the ceiling-mounted supply unit.

**[0003]** DE 40 21 013 C2 describes a supply unit with a height-adjustable, vertically oriented connection head, with which a medical instrument can be coupled. A coupling part, which is located at the instrument and is provided with vertical guide surfaces, engages a mounting part present at the connection head in an accurately fitting manner. In the case of an accurately fitting engagement, the electric switching contacts are released such that a suitable height adjustment as well as the setting up of the supply lines to the instrument with the operating media, e.g., electricity and gases, can be performed.

**[0004]** The fact that it is necessary for the user to perform the corresponding setting of the height and to set up the supply lines between the supply unit and the instrument manually, e.g., by plugging in cable and tube connections, in addition to the mechanical coupling operation, proved to be a drawback of the known invention.

## SUMMARY OF THE INVENTION

**[0005]** The object of the present invention is therefore to provide a supply unit for accommodating medical instruments, which guarantees an extensive automation during the coupling of the instrument with the supply unit as well as the release of supply lines.

**[0006]** According to the invention, a supply unit for accommodating medical instruments

has a height-adjustable middle part with side cheeks, which are designed to engage a middle part of a medical instrument with complementary lateral guide surfaces. So-called end position sensors are provided at the middle part of the supply unit. The sensors send a corresponding signal to an evaluating and control unit connected to the supply unit when the height-adjustable middle part of the supply unit has been moved upward to the extent that pins, which are arranged at the middle part of the supply unit and project upward, are completely accommodated by downwardly open pin-mounts at the middle part of the medical instrument. Plug-type connections for power supply, for data transmission and for pneumatic supply are released by the evaluating and control unit in this case. End position sensors means detect that a corresponding signal is, indeed, sent to the evaluating and control unit only when the upwardly projecting pins have reached their end positions in the downwardly open pin mounts.

**[0007]** In a preferred embodiment of the supply unit for accommodating medical instruments, provisions are made for the transfer of medical gases as well as for the generation of a vacuum in the case of the pneumatic supply.

**[0008]** The end position sensors of the supply unit are advantageously designed as photoelectric cells.

**[0009]** In another preferred embodiment of the supply unit, flaps are provided as splash-proofing for the connection jacks for the power supply, for the data transmission as well as for the pneumatic supply.

**[0010]** According to another important embodiment of the supply unit, the supply unit is designed as a ceiling-mounted supply unit.

**[0011]** An exemplary embodiment of the present invention will be shown on the basis of schematic drawings and explained in greater detail below. The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and specific objects attained by its uses, reference is made to the accompanying drawings and descriptive matter in which the preferred embodiment of the invention is illustrated.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0012]** Figure 1A is a perspective rear view of a medical instrument in the area in which the instrument is accommodated by the supply unit in the top part of the figure;

**[0013]** Figure 1B is a perspective front view of a supply unit, likewise in the area in which the instrument is accommodated by the supply unit in the bottom part of the figure;

**[0014]**      **Figure 2A**      is a side view of a first part of a time sequence of a coupling operation as well as of an uncoupling operation between a medical instrument and a ceiling-mounted supply unit;

**[0015]**      **Figure 2B**      is a side view of a second part of a time sequence of a coupling operation as well as of an uncoupling operation between a medical instrument and a ceiling-mounted supply unit;

**[0016]**      **Figure 2C**      is a side view of a third part of a time sequence of a coupling operation as well as of an uncoupling operation between a medical instrument and a ceiling-mounted supply unit;

**[0017]**      **Figure 2D**      is a side view of a fourth part of a time sequence of a coupling operation as well as of an uncoupling operation between a medical instrument and a ceiling-mounted supply unit;

**[0018]**      **Figure 2E**      is a side view of a fifth part of a time sequence of a coupling operation as well as of an uncoupling operation between a medical instrument and a ceiling-mounted supply unit; and

**[0019]**      **Figure 2F**      is a side view of a sixth part of a time sequence of a coupling operation as well as of an uncoupling operation between a medical instrument and a ceiling-mounted supply unit.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

[0020] Referring to the drawings in particular, Figure 1A shows a perspective rear view of a medical instrument 12. The instrument 12 is accommodated by the supply unit 1 shown in Figure 1B. The medical instrument 12 has a middle part in the middle area with lateral guide surfaces 3. On the side of the middle part facing away from the viewer, the middle part has two vertically extending rails 5 shown in dashed line. A first pneumatic coupling part 16 with connection plugs for the pneumatic supply 11 is located on the left at the instrument 12. A first electric and electronic coupling part 17, which has both connection plugs for the power supply 7 and connection plugs for the data transmission 9, is shown on the right-hand side. Furthermore, two pin mounts 15, which are downwardly open, are located in the middle area above the middle part. The bottom part of Figure 1 shows a perspective front view of a supply unit 1 in the area in which the medical instrument 12 is accommodated by the supply unit 1. On the left, the supply unit 1 has a second pneumatic coupling part 18, which has connection jacks for the pneumatic supply 10, which are complementary to the connection plugs for the pneumatic supply 11. A second electric and electronic coupling part 19 of the supply unit 1, at which both connection jacks for the power supply 6 and connection jacks for data transmission 8 are located, is located on the right. The connection jacks for the power supply 6 are complementary to the connection plugs for the power supply 7, and the connection jacks for the data transmission 8 are complementary to the connection plugs for the data transmission 9.

[0021] Side cheeks 2 are designed such that they accurately fit the lateral guide surfaces 3

of the middle part of the medical instrument 12 during coupling. The side cheeks or side surfaces 2 are arranged in the middle area of the supply unit 1. Two end position sensors 4 are arranged on the side of the middle part of the supply unit 1 facing the viewer. The end position sensors 4 send a corresponding signal to an evaluating and control unit 21 in Figure 1B, when the supply unit 1 has been moved up to the extent that two pins 14 are completely accommodated in the corresponding, complementarily designed pin mounts 15 in the medical instrument 12. The connection jacks for the pneumatic supply 10, for the power supply 6 and for the data transmission 8 can be advantageously covered by flaps 13, which are used as a splash proofing. The flaps 13 are shown in the opened state in the figure. They are opened when the medical instrument 12 is accommodated by the supply unit 1 and they are otherwise closed.

[0022] Figures 2A to 2F show the time sequence of a coupling as well as uncoupling operation between a medical instrument 12 and a supply unit 1 designed as a ceiling-mounted supply unit in six lateral views at time t1 through t6.

[0023] The instrument 12 and the supply unit 1 are still separated in the view at time t1 in Figure 2A, but the instrument 12 is being moved toward the supply unit 1, indicated by the horizontally extending arrow pointing to the left. The flap 13 designed as a splash proofing for the second pneumatic coupling part 18 of the supply unit 1 is still closed, but it shall be opened for the coupling operation between the instrument 12 and the supply unit 1, represented by the arc-shaped arrow over the flap 3.

[0024] The upward movement of the supply unit 1 is initiated from a remote control unit 20 at the instrument 12.

[0025] The flap 13 is already shown in the opened position in the view at time t2 in Figure 2B, and the second pneumatic coupling part 18 of the supply unit 1 as well as the first pneumatic coupling part 16 of the instrument 12 are already arranged one on top of another.

[0026] The supply unit 1 has already been moved up in the view at time t3 in Figure 2C indicated by the vertically extending and upwardly pointing arrow. As a consequence, the instrument 12 no longer has any contact with the floor.

[0027] The coupled state between the instrument 12 and the supply unit 1 in the resting state is shown in the view at time t4 in Figure 2D.

[0028] The lowering of the supply unit 1 is indicated in the view at time t5 in Figure 2E by the vertically extending and downwardly pointing arrow.

[0029] The supply unit 1 and the instrument 12 are again uncoupled in the view at time t6 in Figure 2E, and the flap 13 is again closed, recognizable from the rounded arrow extending above it. The horizontally extending arrow pointing to the right shows that the instrument 12 has already been moved away from the supply unit 1.



**[0030]** While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.